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Publication date:
2018

Document Version
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

Citation for published version (APA):
Rasmussen, S., & Nielsen, C. K. (2018). *Preoperative pain profile and the metabolic response to the surgical trauma in knee cruciate ligament reconstruction*. Poster presented at IASP 2018, Boston, United States.

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Preoperative pain profile and the metabolic response to the surgical trauma in knee cruciate ligament reconstruction

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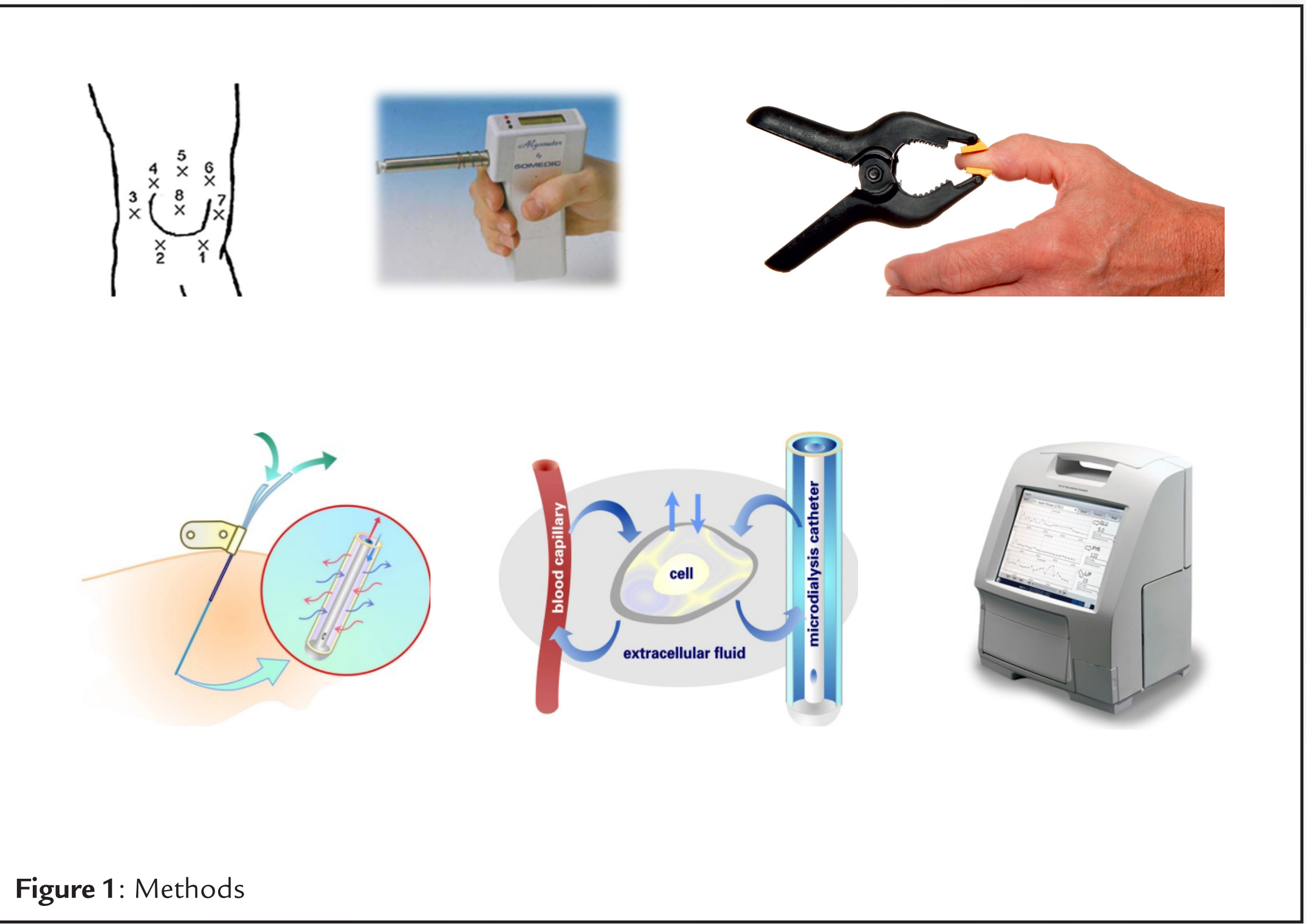
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Aim of Investigation

Every year 2700 patients in Denmark is undergoing reconstruction of the anterior cruciate knee ligament (ACL) as day case surgery. Pain management relates to the surgical trauma and the preoperative pain profile. Our aim was to investigate the pain threshold before surgery and the metabolic response in the skeletal muscle to the surgical trauma during ACL reconstruction.

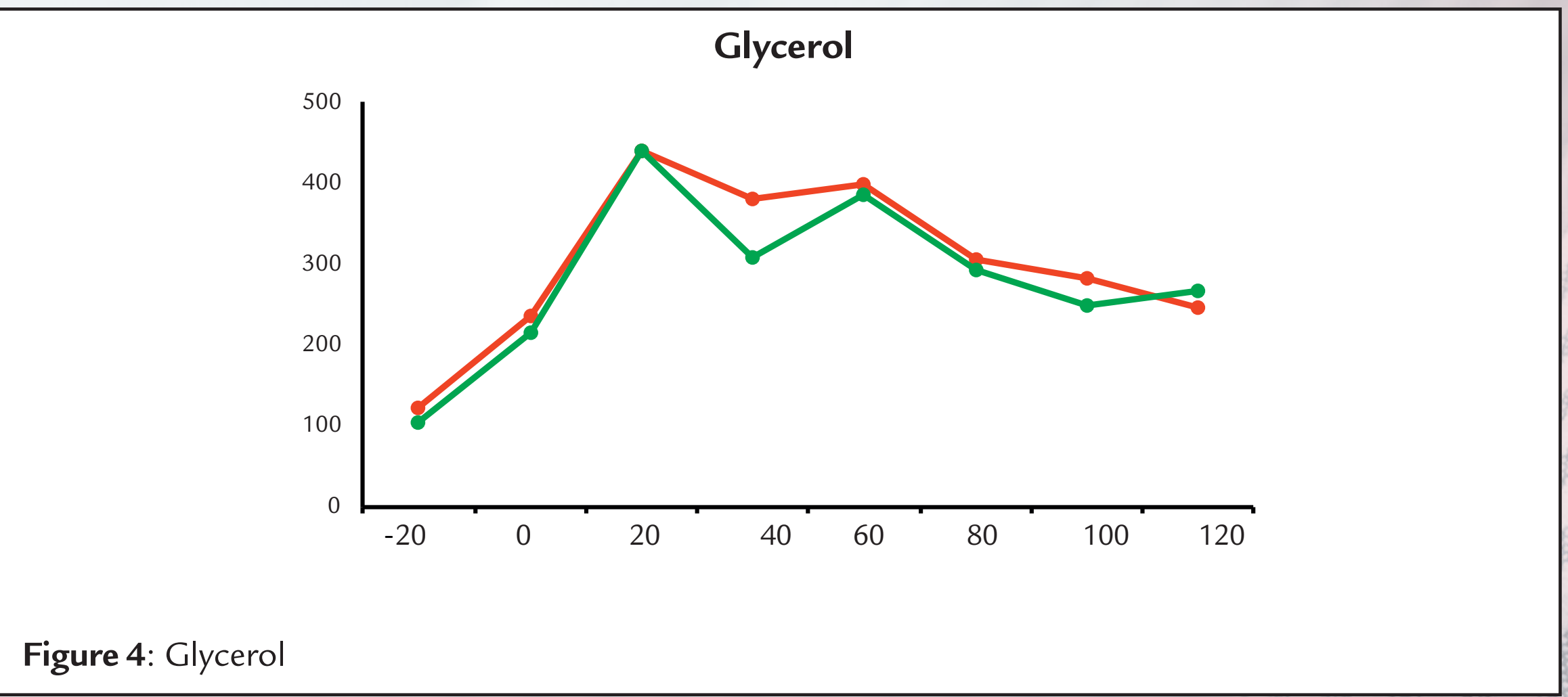
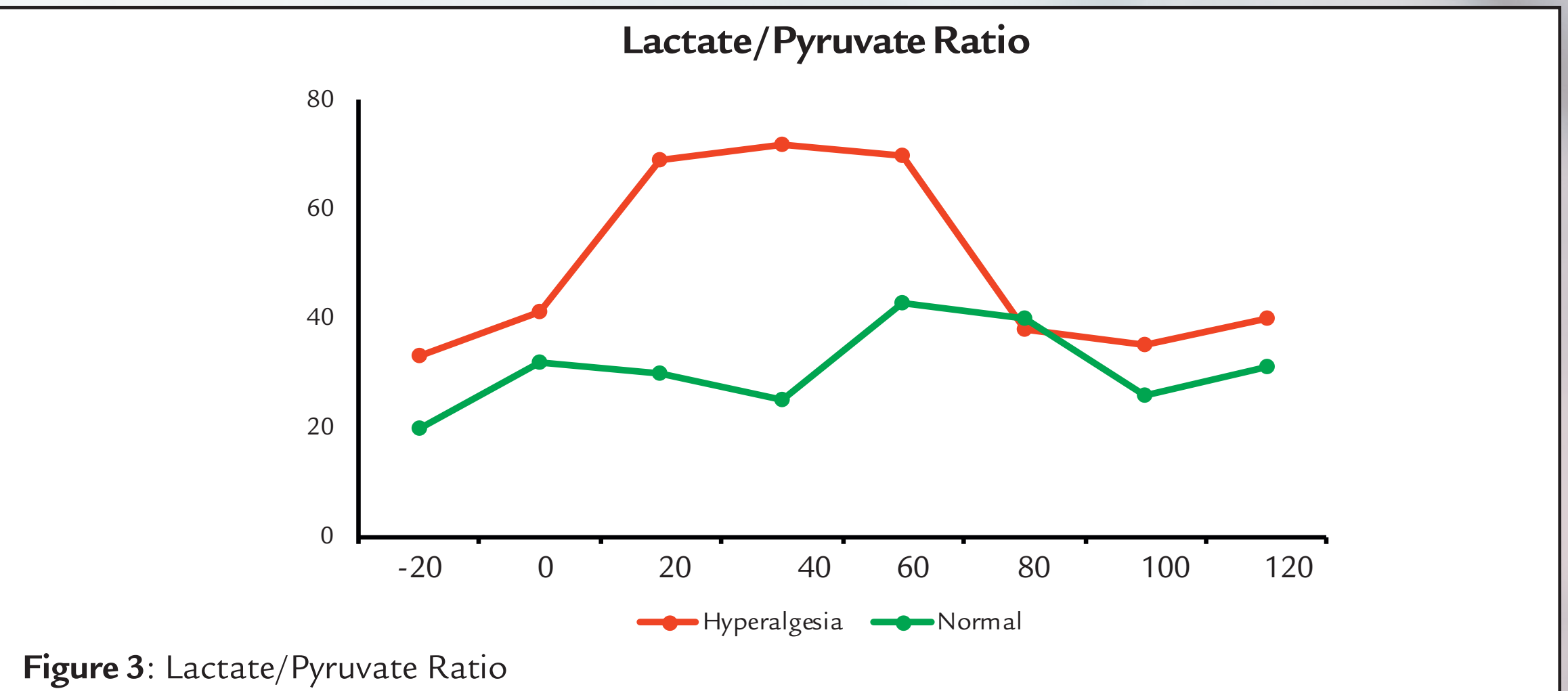
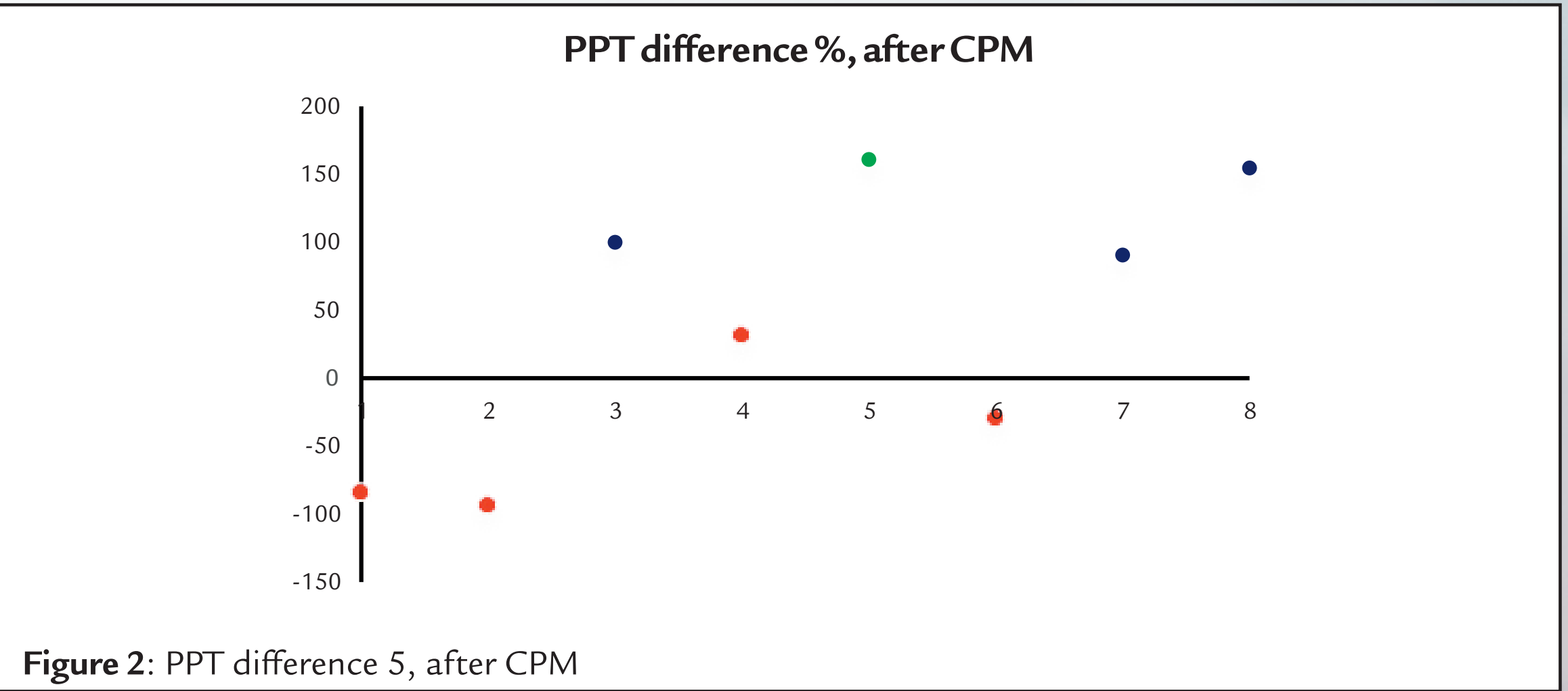
Methods

Six males and two women (age 23-26) with ACL lesion were included in the prospective cohort study. The patients underwent the standard procedure for reconstruction of the knee ACL using a hamstring graft. We investigated before surgery patient's pain threshold and pain sensibility with a digital pressure pain threshold algometer (PPT) and a mechanic spring-clamp (MSC). PPT was assessed over the knee joint at eight points. The procedure was performed two times, and in between MSC was used to promote conditioned pain modulation (CPM). Prior to the surgery, two MC catheters were inserted in the musculus vastus lateralis of the leg with the lesion of ACL. The interstitial dialysate was collected with an interval of 20 minutes during a 2 hours reperfusion period (during and shortly after the surgery). Glucose, lactate, pyruvate and glycerol in mmol/L and lactate/pyruvate molar ratio (L/P ratio) was used as indicators of tissue trauma. (Figure 1)



Results

The CPM changed PPT 31.1 (-93.3; 159.7) % (Figure 2). The difference in change of PPT divided into the 4 upper positives versus the 1 low and 3 negatives. The L/P ratio increased to 72 (11.4; 133.6) at 40 minutes after initiation of surgery and was normalised after 140 minutes (Figure 3). The glucose concentration was stable (4.6 (4.1; 5.1)) and the glycerol concentration change to maximum 381 (204; 552) (Figure 4), followed the change in the L/P ratio. The difference in change of PPT were significantly related to the change in L/P ratio ($P = 0.0098$) (ANOVA R-squared 0.27) (Figure 3).



Conclusions

The difference in pressure pain threshold response to conditioned pain modulation indicates some degree of hyperalgesia in four of the patients before surgery. This difference seems associated with the degree of change in L/P ratio indicating hyperalgesia before surgery may influence the metabolic response to surgery. Using microdialysis to measure metabolites to due to the surgical trauma may be useful to measure altered metabolic response to pain⁽¹⁾. Studies with larger sample size are necessary to verify these results and to evaluate the association to postoperative pain.

References

1. Sørensen LB, Gazzerani P, Wählén K, Ghafouri N, Gerdle B, Ghafouri B. Investigation of biomarkers alterations after an acute tissue trauma in human trapezius muscle, using microdialysis. Sci Rep. 2018 Feb 14;8(1):3034